

SECTION 15887
HVAC AIR FILTERS AND COMPONENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions apply to this Section.

1.2 SECTION INCLUDES:

- A. Requirements for air filters and filter components specifically used only for HVAC systems:
 - 1. Extended-Surface Disposable Panel Filters.
 - 2. High Efficiency Filters (90-95% Efficient).
 - 3. High Efficiency Particulate Air (HEPA) Filters (99.97% on 0.30 micron particles).
 - 4. Ducted Terminal HEPA Filters (99.999% on 0.12 micron particles).
 - 5. Filter Frames (Front & Rear access).
 - 6. Side-Service Housings.
 - 7. Filter Gauges.
- B. Process related (HEPA) filters for the Target Building is specified under Section 15885.

1.3 REFERENCES

- A. American Society of Heating, Refrigeration and Air Conditioning engineers (ASHRAE).
 - 1. ASHRAE 52.1-92, Standard for Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning and Devices Used for General Ventilation in Removing Particulate Matter.
- B. National Fire Protection Association (NFPA).
 - 1. NFPA 90A, Standard for Installation of Air Conditioning and Ventilating Systems.
 - 2. NFPA 90B, Standard for Installation of warm Air heating and Air Conditioning Systems.
- C. Underwriters Laboratories (UL).
 - 1. UL 486A, Standard for Safety Wire Connectors and Soldering Lugs for Use with Copper Conductors.
 - 2. UL 486B, Standard for Safety Wire Connectors for Use with Aluminum Conductors.
 - 3. UL 900-87, Standard for Safety Test Performance of Air Filter Units.

1.4 SUBMITTALS

- A. Submit the following for approval:
 - 1. Product Data: Include dimensions; shipping, installed, and operating weights; required clearances and access; rated flow capacity, including initial and final pressure drop at rated airflow; efficiency and test method; fire classification; furnished specialties; and accessories for each model indicated.
 - 2. Shop Drawings: Include plans, elevations, sections, and details to illustrate component assemblies and attachments.
 - a. Show filter rack assembly, dimensions, materials, and methods of assembly of components.
 - b. Include setting drawings, templates, and requirements for installing anchor bolts and anchorages.

3. Maintenance Data: For each type of filter and rack to include in maintenance manuals specified in General and Supplementary Conditions.
4. Documentation of compliance with UL 900 classifications (Class I or II with UL-registered manufacturer control number).
5. Documentation of atmospheric dust spot efficiency test report in accordance with ASHRAE 52.1.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Provide air filters, frames, housing, gauges, retainers, and clips as indicated on drawings. Filters specified as part of an air handling unit assembly shall be identified by size, capacity and efficiency, and supplied as part of the air handler.

2.2 SOURCE QUALITY CONTROL

- A. Loose filters shipped in container are to be marked by the manufacturer with the following information contained on a label. (Label size to be minimum 3 in. X 6 in. with minimum text size 1/4 in. high.)
 1. Manufacturer's identification of type, size, efficiency and class by catalog number (each shipping container to contain only items with same Manufacturer's catalog number).
 2. UL 900 classification (Class I or Class II) with UL-registered manufacturer's control number.
 3. Manufacturer and point of shipment.
 4. ASHRAE atmospheric dust spot efficiency. (Filter with less than 20% dust spot efficiency to be marked with "N/A" for this category.)
 5. Air filter dimensions.
- B. Filter element to have UL 900 Classification (UL Class I or II) marked on each element.

2.3 EXTENDED-SURFACE, DISPOSABLE PANEL-TYPE PRE-FILTERS

- A. Description: Factory-fabricated, dry, extended-surface filters with holding frames.
- B. Media: Fibrous material formed into deep-V-shaped pleats and held by self-supporting wire grid.
- C. Media and Media-Grid Frame: Galvanized steel.
- D. Duct-Mounting Frames: Welded, galvanized steel with gaskets and fasteners, and suitable for bolting together into built-up filter banks.
- E. Filter frame shall be arranged for front face load, when filter access plenums are provided, suitable for 4-inch deep pleated media filter. Frame shall be 16 gauge galvanized minimum, with continuous solid bulb type rubber gasket filter sealers and holding retainer clips, arranged for upstream loading of the filters from the entering air side service plenum.
- F. Provide two complete sets of pre-filters equal to Cam-Farr 30/30 composed of 4-inch thick pleated media, tested at 4 inches WC, and rated at 30 to 35 percent efficiency per ASHRAE Test Standard 52-76. Filters and frames shall be universal industry standard 24-inch by 24-inch, or 24-inch by 12-inch size for interchangeability.

2.4 HIGH EFFICIENCY FILTERS

- A. Ninety five (95) percent efficient "bag-type" pre-filter shall include a complete frame and filter assembly. Filter frame shall be arranged for front face load, suitable for 20-inch deep pleated media. Frame shall be 16 gauge minimum with continuous solid bulb type rubber gasket filter sealers and holding retainer clips, arranged for upstream loading of the filters from the entering airside service plenum. Provide two complete sets of high density glass fiber media filters, tested at 4 inches WC, and rated at a mean efficiency of 90-95 percent by ASHRAE Test Standard 52-76. Filters and frames shall be universal industry standard 24-inch by 24-inch by 12-inch size for interchangeability. Frame shall be galvanized. Assembly should be equal to Cam-Farr RIGA-FLO 200.

2.5 HIGH-EFFICIENCY PARTICULATE AIR (HEPA) FILTERS

- A. Description: Factory-fabricated HEPA filters with holding casing.
- B. Media: UL 586, fibrous glass, constructed of continuous sheets with closely spaced pleats with vinyl-coated aluminum separators.
- C. Frame Material: Galvanized steel.
- D. Media to Frame Side Bond: Neoprene adhesive.
- E. Face Gasket: Neoprene expanded rubber.
- F. Duct-Mounting Frames: Construct downstream corners of holding device with cushion pads to protect media. Provide bolted filter-sealing mechanism to mount and continuously seal each individual filter.
- G. Frame and filter assembly suitable for the space provided. Filter frame shall be front face load, suitable for 12-inch deep cartridge filter. Frame shall be 16 gauge minimum stainless steel with continuous special knife-edge seats and holding retainer clips arranged for upstream loading of the filters from the entering air side service plenums.
- H. Filters shall be scanned, HEPA type rated at 99.97 percent efficient on all particles 0.3 micron and larger with 380 fpm filter velocity by atmospheric dust test. Filters shall be capable of uniform air velocity. Obstructions to airflow shall be minimized to maintain a uniform pattern. Filter frame shall be sealed to the cabinet with a mechanical fastener to eliminate all air bypass around the filter frames. Filter cartridge shall incorporate special-material chlorine/bromine free urethane based gel compatible with the frame knife-edge mating seat. Filter frames shall be stainless steel or anodized aluminum.
- I. DOP smoke scanning of filters will not be permitted due to residual offgas contamination. The air handler manufacturer shall be responsible to require the filter manufacturer to use only the following atmospheric dust certification procedure.
 - 1. Filter media samples shall be taken from all rolls of media intended for fabrication into filters. The media samples shall be tested with hot DOP on a Penetrometer Q127 at a flowrate of 10.5 fpm. Efficiency shall be a minimum of 99.9995 percent.
 - 2. All filters shall be tested for overall efficiency using natural atmospheric contaminants with dual laser particle counters sampling simultaneously upstream and downstream of the filter. The filter efficiency shall be a minimum of 99.97 percent on particles 0.3 micron in diameter. Upstream filter challenge shall be at least 100,000 particles per cubic foot.
 - 3. Filters will be scan tested at the factory using natural atmospheric air or polystyrene latex (PSL) challenge with a minimum of 1,000,000 particles per cubic foot, and monitored with 1

cfm sampling particle counter sensing total particles 0.3 micron diameter and greater. No DOP or other synthetic contaminants will be allowed. All leaks evidenced by the particle counter sensing five or more counts in a 2 second interval shall be repaired.

4. If leaks are found in the filter, use RTV 732 for patching and field caulking the filters in place
- J. The filter manufacturer shall submit a written report confirming the test results of all media tests.
- K. Air handler manufacturer is responsible for procurement of filters to this Specification and shall be required to correct leaks or replace filters not passing field certification test.
- L. Filters shall be packaged separately for storage until installation prior to startup.

2.6 DUCTED TERMINAL HEPA FILTERS

- A. The sides of the filter shall be constructed of extruded clear anodized aluminum. The top shall be constructed of aluminum plate and shall be clipped and sealed to the sides without drilling so that no metal shavings are produced. Four holes drilled at the top corners of the filter shall be provided for suspending the unit from overhead structural supports. Filters shall be suitable for T-bar installation. Filters shall be Flanders Model TH52-E, or approved equal.
- B. A downstream diffuser, constructed of cold-rolled steel and pointed white, shall be flush mounted to the unit. The downstream diffuser shall have an internal opposed blade damper that shall be adjustable from room side.
- C. The unit shall have a 3 inch high aluminum swaged inlet which shall be permanently welded to the top. The inlet shall be 10 inches in diameter.
- D. Air flow control shall be provided by an adjustable baffle constructed of aluminum with a 40 percent open circular perforation and butterfly damper located in the unit to distribute the incoming air flow. The adjustable baffle plate and butterfly damper shall be adjustable from beneath the installed unit, without having to take off the grille, by removing the wellnut provided in the centerboard and inserting a standard flathead screwdriver into a slot to operate the rotary-type control mechanism.
- E. The integral filter element contained in the unit shall be industrial grade HEPA – unscanned. The filter element shall be tested in accordance with Mil-Std-282 for resistance to airflow and overall penetration greater than .03 percent of the upstream concentrate. The filter shall have a minimum initial efficiency of 99.999 percent on 0.12 micron size particles, hot DOP test, per IES RP-001-86 for Type C filter. When operated a face velocity of 100 feet per minute, the initial pressure drop across the filter with the butterfly damper option open shall be no more than .45 inches wg in open position.
- F. The filter medium shall be all-glass with a wet strength, water repellent binder in accordance with MIL-F-51079 (latest issue) and shall be produced by the filter manufacturer. The filter element shall be constructed by pleating a continuous sheet of medium so that it is self-supporting without the use of separators, tape, string, glue, or strips. Raised impressions in the medium shall align against each other to hold adjacent folds apart so that pack is self-separating.
- G. The medium shall be permanently bonded to the frame of the module with a fire retardant solid urethane. Construction of the filter shall be in accordance with the essential requirements of MIL-F-51068 (latest issue).
- H. For shipment, each filter shall be polybagged and encased by linerboard sleeves that fit within the filter carton. Filters shall be shipped one per carton. The filter and its carton shall bear labels indicating filter model number and compliance with IES RP-CC-001-86.

2.7 FILTER FRAMES, FRONT-AND REAR-ACCESS

- A. Framing System: Aluminum framing members with access for either upstream (front) filter servicing, cut to size and pre-punched for assembly into modules. Vertically support filters prevent deflection of horizontal members without interfering with either filter installation or operation.
- B. Prefilters: Incorporate a separate track, removable from front or back.
- C. Sealing: Factory-installed, positive-sealing device for each row of filters to ensure seal between gasketed filter elements to prevent bypass of unfiltered air.

2.8 SIDE-SERVICE HOUSINGS

- A. Description: Factory-assembled, side-service housings, constructed of galvanized steel, with flanges to connect to duct system.
- B. Prefilters: Integral tracks to accommodate 2-inch (50-mm) disposable or washable filters.
- C. Access Doors: Continuous gaskets on perimeter and positive-locking devices. Arrange so filter cartridges can be loaded from either access door.
- D. Sealing: Incorporate positive-sealing gasket material on channels to seal top and bottom of filter cartridge frames to prevent bypass of unfiltered air.

2.9 FILTER GAGES

- A. Description: Diaphragm type with dial and pointer in metal case, vent valves, black figures on white background, and front recalibration adjustment.
 - 1. Diameter: 4-1/2 inches (115 mm).
 - 2. Prefilter Range: 0- to 0.5 inch WG (0 to 125 Pa.).
 - 3. Medium Efficiency Filter Range: 0-to 1.0-inch WG (0 to 250 Pa.).
 - 4. HEPA Filter Range: 0- to 3.0-inch WG (0 to 750 Pa.).
- B. Manometer-Type Filter Gage: Molded plastic with epoxy-coated aluminum scale, logarithmic-curve tube gage with integral leveling gage, graduated to read from 0- to 3.0-inch WG (0 to 750 Pa), and accurate within 3 percent of full scale range.
- C. Accessories: Static pressure tips, tubing gage connections, and mounting bracket.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install filter frames according to manufacturer's written instructions.
- B. Position each filter unit with clearance for normal service and maintenance. Anchor filter-holding frames to substrate.
- C. Install filters in position to prevent passage of unfiltered air.
- D. Install a filter gage for each filter bank.

- E. Install filter gage static pressure taps upstream and downstream from filters to measure pressure drop through filter. Mount filter gages on outside of filter housing or filter plenum in an accessible position. Adjust and level inclined gages.
- F. Coordinate filter installations with duct and air-handling unit installations.
- G. Electrical wiring and connections are specified in Division 16 Sections.
- H. Ground equipment.
 - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.2 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components, filter and filter-frame installation, and electrical wiring. Report results in writing.
- B. Operate automatic roll filters to demonstrate compliance with requirements. Test for leakage of unfiltered air while system is operating. Correct malfunctioning units, and then retest to demonstrate compliance. Remove and replace units that cannot be corrected with new units and retest.
- C. HEPA Filters: Pressurize housing to a minimum of **3.0-inch WG (750 Pa)** or to designed operating pressure, whichever is higher; and test housing joints, door seals, and sealing edges of filter with soapy water to check for air leaks.

3.3 CLEANING

- A. After completing system installation and testing, adjusting, and balancing air handling and air-distribution systems, clean filter housings and install new filter media.

END OF SECTION 15887